

Course Info

The EECS 16AB series (Designing Information Devices and Systems) is a pair of introductory-level courses introducing students to EECS. The courses have a particular emphasis on how to build and understand systems interacting with the world from an informational point of view. Mathematical modeling is an important theme throughout these courses, and students will learn many conceptual tools along the way. These concepts are rooted in specific application domains. Students should understand why they are learning something.

An important part of being a successful engineer is being able to identify the important and relevant structure in a complex problem while ignoring minor issues. EECS 16A focuses on modeling as abstraction: how can we see the relevant underlying structure in a problem? It introduces the basics of linear modeling, largely from a "static" and deterministic point of view. EECS 16B deepens the understanding of linear modeling and introduces dynamics and control, along with additional applications. Finally, EECS 70, (which can be thought of as the third course in this sequence – except without any labs), introduces additional discrete structures for modeling problems, and brings in probability.

In EECS 16A in particular, we will use the application domains of imaging and tomography, smartphones and touchscreens, and GPS and localization to motivate and inspire. Along the way, we will learn the basics of linear algebra and, more importantly, the linear-algebraic way of looking at the world. The emphasis will be on modeling and using linear structures to solve problems; the class is not just focused on how to do computations. We will learn about linear circuits, not merely as a powerful and creative way to help connect the physical world to what we can process computationally, but also as an exemplar of linearity and as a vehicle for learning how to do design. Circuits also provide a concrete setting in which to learn the key concept of "equivalence" – an important aspect of abstraction. Our hope is that the concepts you learn in EECS 16A will help you as you tackle more advanced courses and will help form a solid conceptual framework that will help you learn throughout your career.

Grade Breakdown

Our objective is to help you become the best engineer you can be, and grades are not everything. The various components of the class: homework, labs and exams are designed explicitly with this in mind. Every challenge is a growth opportunity. You will have the opportunity to gain points in the course through completing your homework, attending labs as well as through the exams.

This course is not graded on a curve. We will set absolute thresholds for performance that will map to grade boundaries. We encourage you to discuss the course material with each other and teach each other new ideas and concepts that you learn. Teaching the material is one of the best ways to learn, so discussing course material with colleagues in the class is a win-win situation for everyone. Grades are not everything, far from it, but that said, here is the breakdown for grading for this class.

Participation	20 points
Homework	35 points
Labs	45 points
Midterm 1	50 points
Midterm 2	50 points
Final	100 points



Notice that you can get many points by being regular with your homework and the labs. In addition, there will be opportunities to get extra credit in the class. Our goal is to help you learn the material as best as possible!

Grading Scale

This course is not curved. We define the following grading scale (in percentages):

A+	[100+]	A	[93+]	A-	[90+]
B+	[84+]	B	[75+]	B-	[68+]
C+	[65+]	C	[62+]	C-	[58+]
D+	[57+]	D	[55+]	D-	[53+]
F	[0-, 53)				

In the rare event that the instructors deem that a change needs to be made for a given exam, then you will be told where the grade boundaries are for that exam and how to adjust your score on the exam to get your points on the above scale. You will always know how you are doing in the course grade-wise.

Content-Creation Extra Credit

We will also award extra-credit points for students who create content and learning tools that benefit the entire class (e.g. a video demo of your lab, an illustrative pictorial explanation of a concept, a nice iPython demo, creating lecture slides to share with students, other creative content that engages with the course content). These can be posted to Piazza under the "student_content" folder and will be awarded extra credit at the discretion of a TA. The TA must endorse the content as high quality. If you have an idea of something you want to do and are wondering if it will count as extra credit please contact eeecs16a@berkeley.edu (mailto:eeecs16a@berkeley.edu).

Exam Clobber Policy

This course spans a fairly broad set of ideas and concepts within a short period of time, and hence sustained and consistent effort and investment are critical to your success in this class. Similarly, by far the most common operating mode we have observed in previous students who struggled and/or failed this class was attempting to do the bare minimum in general and then catch up/cram right before the exams.

In order to formally encourage all of you to maintain the sustained effort that we have observed to be critical to success, we will be adopting a new policy regarding exam clobbering, participation, and effort. Specifically, for students who (1) complete an optional midterm redo and (2) perform significantly better on the corresponding part of the final (linear algebra or circuits) than on the relevant midterm, we will provide the opportunity to clobber a midterm.

If you qualify for the clobber (i.e. (1) and (2)), you may replace your lowest midterm score with your scaled score on the final exam according to the formula below.

Replacement MT score (on scale of 100) = $\max[\text{MT score}, \text{final exam score} - 15\% \text{ (on scale of 100)}]$ This essentially allows you to replace your midterm grade by a higher grade --- we want to reward improved performance.

If you complete the optional midterm redo for both midterms, and are eligible for a clobber on both midterm, the clobber that helps your score more is applied (i.e. you may clobber either Midterm 1 or Midterm 2, but not both, and only if you complete both midterm redos). Please note that even though lecture attendance is not included (for logistical reasons) in the two criteria for clobbering eligibility, we do strongly encourage you to attend lecture in person.

Participation

Participation is worth a maximum of 20 points, and is measured by discussion attendance - to get full participation credit, you must attend 16 discussions throughout the course of the semester. Your grade will be prorated by the number of discussions you attend; i.e., if you attend 12 discussions, you will have $12/16 * 20 = 15$ points in this category.

Homework Party

Homework parties are your chance to meet and interact with other students, while also having the chance to get help from GSIs, Tutors and Faculty. This is your chance to have a social experience as part of the class. We expect students to treat each other with respect during homework parties as well as during all other parts of the class – including interactions on Piazza, discussion and office hours. Remember that each of you is coming into a class with different experiences and backgrounds – use this as an opportunity to learn from one another.

Wednesdays 2-4PM, Thursdays 9-11AM, and Thursdays 2-4PM, HW Party will be held in Soda's Wozniak Lounge or Cory 144MA. Check the course calendar for location. Attending homework party highly encouraged.

Students are expected to help each other out, and if desired, form ad-hoc "pickup" homework groups in the style of a pickup basketball game. We highly encourage students to attend homework party.

Association of Women in EE&CS (AWE) Office Hours

AWE Office Hours are co-hosted by the Association of Women in EE&CS (AWE). These OHs will be staffed by female course staff members and AWE members but will otherwise function the same as regular OHs. Our hope is to offer an alternative OH environment and give you more autonomy to learn in whichever environment best suits your personal learning style. All students are welcome to attend.

Professor Ranade Roundtables

This year, you have the opportunity to sit down and snack with Professor Ranade! Professor Ranade will be hosting several roundtables on Thursdays for the next few weeks. This is a chance to meet your professor outside of a formal, classroom environment. Please stop by for informal conversation about 16A, Berkeley, faculty life, research, applications of 16A, or anything else. Sign up at this link (<https://forms.gle/JuZ7rLGrz39Y9AFs9>) (plus, there will be snacks)!

Homework Submission

Homeworks are due on Friday night at 11:59 PM. You need to turn in a .pdf file consisting of your written-up solutions that also includes an attached pdf "printout" of your .ipynb code on Gradescope; you may use your phone camera or any page-scanning app in order to turn your written homework into a PDF, as long as your work is clear and legible. In addition, Gradescope has an option to associate pages of your work to each homework problem. You must select the relevant pages for every problem. **Any homework submissions that are turned in without the code "printout" (or screenshot) attached will receive a zero on the coded ipython notebook portions of the homework. Any problems without pages selected will receive zero credit.** If you have any questions about the format of a homework submission, please go to office hours or homework party.

You will have the opportunity to resubmit your homework after homework solutions are released to get make-up credit. See below for details.

Homework Grading – Self-Grading

The point of homework in this class is for you to learn the material. To help you in doing this each student will grade their own homework in addition to being graded by 16A readers. After the HW deadline, official solutions will be posted online. You will then be expected to read them and enter your own scores and comments for every part of every problem in the homework on a simple coarse scale:

Score	Reason
0	Didn't attempt or very very wrong
2	Got started and made some progress, but went off in the wrong direction or with no clear direction
5	Right direction and got half-way there
8	Mostly right but a minor thing missing or wrong

10	100% correct
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Note: You must justify self-grades of 2, 5, or 8 with a comment. Grades of 0 and 10 do not need to be justified. If you are really confused about how to grade a particular problem, you should post on Piazza. This is not supposed to be a stressful process.

We will hold extra office hours that will do HW run-throughs after the HW solutions have been released. These will be held on Monday, and we encourage you to attend them to ask questions about grading and clarify your understanding of the HW and solutions.

Your self-grades will be due on the Monday following the homework deadline at 11:59 PM sharp. We will accept late self-grades up to a week after the original homework deadline for half credit on the associated homework assignment. If you don't enter a proper grade by this deadline, you are giving yourself a zero on that assignment. Merely doing the homework is not enough, you must do the homework; turn it in on time; read the solutions; do the self-grade; and turn it in on time. **Unless all of these steps are done, you will get a zero for that assignment.**

We will automatically drop the lowest homework score from your final grade calculation. This drop is meant for emergencies. If you use this drop half-way into the semester, and request another, we cannot help you. EE47D students will not have their lowest homework score dropped.

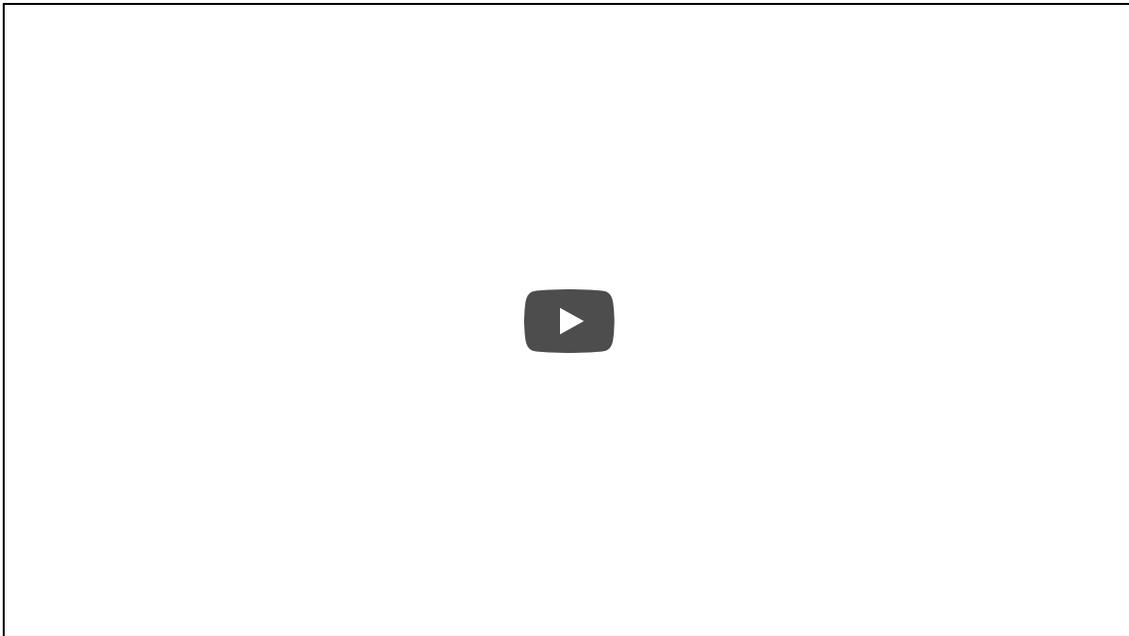
Just like we encourage you to use a study group for doing your homework, we strongly encourage you to have others help you in grading your assignments while you help grade theirs.

Course readers are going to be grading and sending you occasional comments. Because we have reader grades, we will catch any attempts at trying to inflate your own scores. This will be considered cheating and is definitely not worth the risk. Your own scores will be used in computing your final grade for the course, adjusted by taking into account reader scores so that everyone is fairly graded effectively on the same scale. For example, if we notice that you tend to give yourself 5s on questions where readers looking at your homeworks tend to give you 8s, we will apply an upward correction to adjust.

Reader grades will be released on Gradescope about one week after the homework deadline. Readers grade questions either on a "coarse" or "fine" scale for each homework part. Coarsely graded question parts are worth a single point and are based on effort. Finely graded question parts are worth a total of 10 points and are graded using the same self-grading rubric above. Homework regrade requests are typically due on Gradescope within 72 hours of reader grades being released. If a regrade request is submitted for a part of a question on the homework, the grader reserves the right to regrade the entire homework and could potentially take points off.

If you have any questions, please ask on Piazza.

Self-Grade Walkthrough



Homework Resubmission

Again, the point of homework in this class is to help you learn. We understand that sometimes work from other classes, midterms or your personal life can come in the way of making a homework deadline. For this reason we will allow you to resubmit your homework for 70% credit. **Homework resubmissions must be HANDWRITTEN. Homework resubmissions will be due along with the self-grades, so they will be due by 11:59pm Monday night. If you choose to resubmit your homework, you must submit two sets of self-grades, one for the first submission and one for the second submission. For the second submission do self-grades as normal. We will apply the 70% correction.**

What does 70% credit mean? Let us say you only were able to get half-way through a problem during the first submission. You submitted your homework on Friday, and while going through the solutions you figured out how to do the whole problem. Your self-grade for your first submission would be a 5/10.

However, you can resubmit the homework problem with a fully correct solution and receive 70% of the remaining points as extra points, i.e. $(10-5) * 70/100 = 3.5$ extra points, and so your score for the problem would go from 5 points to 8.5 points.

Homework Effort Policy

Because the point of homework in this class is to help you learn, not to punish you for making small mistakes, if your final score (after resubmission and any other corrections are applied) on any homework is above 8/10, your grade will automatically be bumped up to 100% (10/10). **If your final score is less than 8/10, it will be scaled accordingly so that a 6/10 will result in 75% (7.5/10).**

Lab and Discussion Section Policies

Ways to check attendance will be posted on Piazza on a later date.

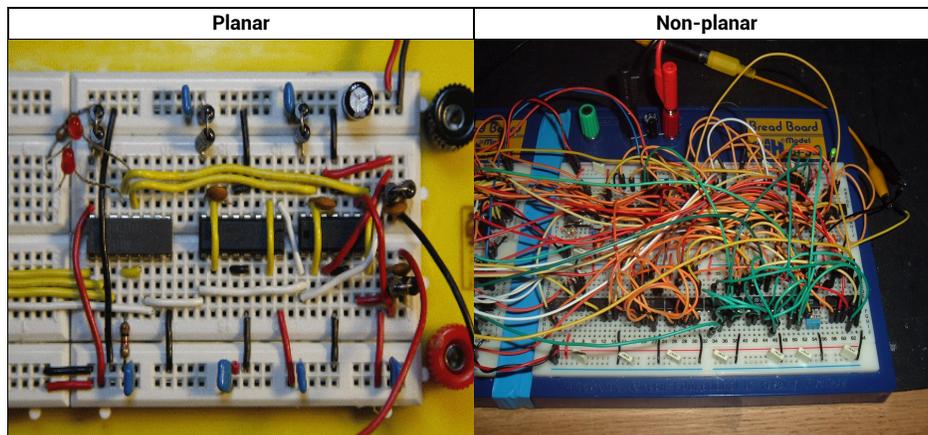
Labs for this class are not open section, you must go to your assigned lab section. If you finish the lab early, we encourage you to help other groups debug their lab. This will help you learn the material better and contribute towards a better learning experience for everyone.

You should aim to get checked-off by the end of your lab section. If you attend your lab but don't finish in time, you may get checked-off at the beginning of your next lab section before starting the following lab. While labs are not meant to be burdensome, they are an essential part of the course. We have the following strict grading policy for labs: **If you complete all the labs, you will receive full lab credit. If you fail to complete one lab, you will receive 42/45 lab credit. If you miss two labs, you will receive half credit. If you miss three or more labs, you will get an F in the class.**

Number of Missed Labs	What Happens?
0	You get full lab credit - 45/45
1	You get almost full lab credit - 42/45
2	You get half lab credit - 22/45
3 or more	You Fail the class - final letter grade: F

Some lab sections are "buffer labs." "Buffer labs" are a several day period in which no new labs begin. During buffer lab sections, you may get checked off for **only one lab** that occurred during that lab module. No other labs can be checked off. You may attend any buffer lab held during a buffer week. The schedule for each buffer week will be different, more details on buffer lab sections will be announced on Piazza for every module.

Wires on lab breadboards must be planar. Lab staff will ask students to redo their circuits before debugging them if the wires are non-planar. The definition of planar wires on a breadboard is shown below:



Please note the three black chips in the picture on the left. Professor Boser's favorite vehicle has three wheels - he rides a tricycle!

You may go to any discussion section. Certain sections will prioritize certain groups of students (e.g. first-year, transfer students, students with prior linear algebra / Math 54 background). Again, we emphasize that we DO NOT expect you to have taken a linear algebra class before EECS16A. All other students are allowed to remain in the section at the discretion of the discussion TA in charge of that section. We encourage you to go to the same discussion sections every week so that the TAs can get to know you personally.

Exam Policies

There are two midterms and one final. The midterms will be October 7th, 2019 from 8pm to 10pm and November 4th, 2019 from 8pm to 10pm. The final will be held on Friday, December 20, from 8am to 11am. Makeup exams will not be scheduled.

Please plan for exams at these times. In case of an emergency on exam day, please email the Head GSI at eecs16a@berkeley.edu (mailto:eecs16a@berkeley.edu) as soon as possible and provide details of the issue as well as a contact phone number. Emergency exam conflicts will be handled on a case-by-case basis. Exam conflicts originating from a lecture conflict will not be accommodated.

On exam day, you must bring your Cal student ID to your exam location. Locations and logistics will be posted on Piazza closer to the exam dates. If you do not take your exam in the correct location, a large penalty will be applied to your exam score. Additionally, regrade requests on Gradescope are typically due within a week of exams being released on Gradescope. Late regrade requests will not be considered. If a regrade request is submitted for a part of a question on the exam, the grader reserves the right to regrade the entire exam and could potentially take points off.

Exceptions and Exam Accommodation

Any requests for exceptions should be emailed to the Head GSI at eeecs16a@berkeley.edu (mailto:eeecs16a@berkeley.edu). Email the exception request out as soon as possible. Exceptions will be handled on a case-by-case basis. Since there is one homework drop, missing homework is rarely excused. Examples of situations that merit an exception are medical emergencies and family emergencies. It will be easier for us to grant an exception if you have a doctor's note or other documentation.

Any requests for exam accommodation should be emailed to the Head GSI at eeecs16a@berkeley.edu (mailto:eeecs16a@berkeley.edu) within 2 weeks of the start of the semester. Exceptions will be handled on a case-by-case basis. Examples of situations that merit an exception are medical emergencies and family emergencies. It will be easier for us to grant an exception if you have a doctor's note or other documentation.

Course Communication

The instructors and TAs will post announcements, clarifications, hints, etc. on Piazza. Hence you must check the EECS16A Piazza page frequently throughout the term. (You should already have access to the EECS16A Fall 2019 forum. If you do not, please let us know.)

If you have a question, your best option is to post a message on Piazza. The staff (instructors and TAs) will check the forum regularly, and if you use the forum, other students will be able to help you too. When using the forum, please avoid off-topic discussions, and please do not post answers to homework questions before the homework is due. Also, always look for a convenient category to post the question to (for example, each homework will have its own category, so please post there). That will ensure you get the answer faster.

If your question is personal or not of interest to other students, you may mark your question as private on Piazza, so only the instructors will see it. If you wish to talk with one of us individually, you are welcome to come to our office hours. Please reserve email for the questions you can't get answered in office hours, in discussion sections, or through the forum.

For any exceptions that are of a personal nature, please contact the head GSI at eeecs16a@berkeley.edu (mailto:eeecs16a@berkeley.edu). Technical and homework questions are best resolved in homework and during office hours.

It can be challenging for the instructors to gauge how smoothly the class is going. We always welcome any feedback on what we could be doing better. If you would like to send anonymous comments or criticisms, please fill out this anonymous feedback form (<https://forms.gle/sCbAifCzywM19xyN9>).

Collaboration

We encourage you to work on homework problems in study groups of two to four people; however, you must always write up the solutions on your own. Similarly, you may use books or online resources to help solve homework problems, but you must always credit all such sources in your write up, and you must never copy material verbatim. **Using previous EECS16A homework, exam, and lab solutions is strictly prohibited, and will be considered academic dishonesty. This is not how you want to start your career as an engineer.**

We expect that most students can distinguish between helping other students and cheating. Explaining the meaning of a question, discussing a way of approaching a solution, or collaboratively exploring how to solve a problem within your group is an interaction that we encourage strongly. But you should write your homework solution strictly by yourself so that your hands and eyes can help you internalize the subject matter. You should acknowledge everyone whom you have worked with, or who has given you any significant ideas about the homework. This is good scholarly conduct.

Don't Be Afraid to Ask for Help

Are you struggling? Please come talk with us! The earlier we learn about your struggles, the more likely it is that we can help you. Waiting until right before an exam or the last few weeks of the semester to let us know about your problems is not an effective strategy - the later it is, the less we will be able to help you.

Even if you are convinced that you are the only person in the class who is struggling, please overcome any feelings of embarrassment or guilt, and come ask for help as soon as you need it - we can almost guarantee you're not the only person who feels this way. Don't hesitate to ask us for help - we really do care that you thrive! You can email eeecs16a@berkeley.edu (mailto:eeecs16a@berkeley.edu), or email / talk to any TA at any time -- we're happy to help.

Advice

The following tips are offered based on our experience.

Do the homeworks! The homeworks are explicitly designed to help you to learn the material as you go along. There is usually a strong correlation between homework scores and final grades in the class.

Keep up with lectures! Discussion sections, labs and homeworks all touch on portions of what we discuss in lecture. **Students do much better if they stay on track with the course.** That will also help you keep the pace with your homework and study group.

Take part in discussion sections! Discussion sections are not auxiliary lectures. They are an opportunity for interactive learning. The success of a discussion section depends largely on the willingness of students to participate actively in it. As with office hours, the better prepared you are for the discussion, the more you are likely to benefit from it.

Please come to office hours! We love to talk to you and do a deep dive to help you understand the material better.

Form study groups! As stated above, you are encouraged to form small groups (two to four people) to work together on homeworks and on understanding the class material on a regular basis. In addition to being fun, this can save you a lot of time by generating ideas quickly and preventing you from getting hung up on some point or other. Of course, it is your responsibility to ensure that you contribute actively to the group; passive listening will likely not help you much. And recall the caveat above that you must write up your solutions on your own. We advise you strongly to spend some time on your own thinking about each problem before you meet with your study partners; this way, you will be in a position to compare ideas with your partners, and it will get you in practice for the exams. Make sure you work through all problems yourself, and that your final write-up is your own. Some groups try to split up the problems ("you do Problem 1, I'll do Problem 2, then we'll swap notes"); not only is this a punishable violation of our collaboration policies, it also ensures you will learn a lot less from this course.

About

EECS 16AB Course Coverage

EECS16AB was specially designed to ramp students up to prepare for courses in machine learning and design and are important classes to set the stage for the rest of your time in the department. A rough breakdown of the content in the classes is as follows:

16A:

Module 1: Introduction to systems and linear algebra
Module 2: Introduction to design and circuit analysis
Module 3: Introduction to machine learning

16B:

Module 1: Differential equations and advanced circuit design
Module 2: Introduction to robotics and control
Module 3: Introduction to unsupervised machine learning and classification

FAQ

Q1: Should I take EECS16A my first semester at Cal?

A1: If you have taken an AP calculus class, then the answer is yes! EECS16A has no prerequisites other than calculus and is designed with freshmen and incoming transfer students in mind. It is designed to be taken alongside 61A. Furthermore, we reserve seats for freshmen and incoming transfer students in the class, so you are essentially guaranteed a spot in the class your first year. It will be harder to get into the class as an upperclassman.

Q2: Should I take EECS 16A and EECS 16B before or after CS 70?

A2: EECS16A and 16B were specifically designed to help ease the transition to CS70 for incoming students. These classes provide an introduction to proofs and the kind of mathematical thinking that is very useful in a class like CS70. We recommend you take 16AB before taking CS70, this should help you have an easier time in CS 70.

Q3: Should I take MATH 54 before taking EECS16A?

A3: EECS 16A is designed to be taken without any prerequisites, so there is no need to take MATH 54 before EECS 16A. EECS 16AB teaches linear algebra with the intent of preparing you for courses like EECS 127 (Optimization) and EECS 189 (Machine Learning) and provides engineering and machine learning examples and applications for linear algebra. EECS 16AB also uses Jupyter notebooks and python so you can better connect linear algebra and computation. There is no need for a CS/EECS student to take Math 54.